Service Manual

74 ST40/01B/02B/07B/60B/65B

Stereo tuner

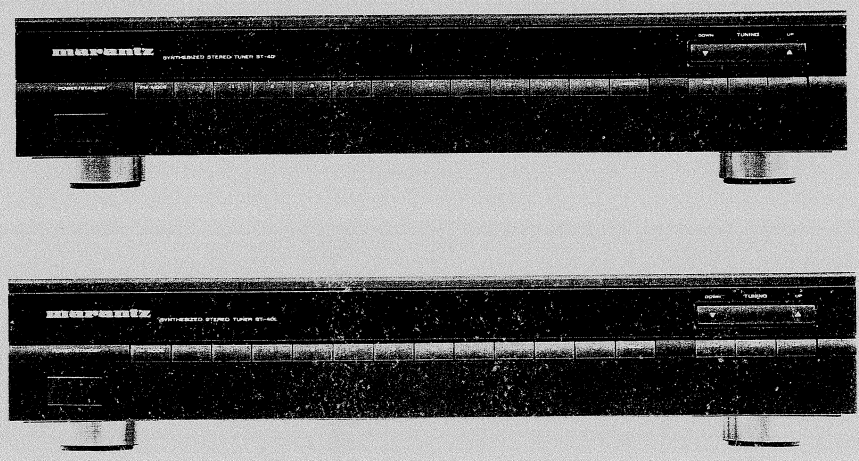


TABLE OF CONTENTS

SECTION		PAGE
1.	BLOCK DIAGRAM	2
2.	SCHEMATIC DIAGRAM (ST-40)	3
3.	SCHEMATIC DIAGRAM (ST-40L)	6
4.	PARTS LOCATIONS (PATTERN SIDE)	9
5.	SCHEMATIC DIAGRAM AND PARTS LOCATIONS (PATTERN SIDE)	12
6.	EXPLODED VIEW AND PARTS LIST	14
7.	SERVICE PROGRAM	16
8.	TUNER ALIGNMENT PROCEDURES	17
9.	ALIGNMENT POINTS AND TEST POINTS	19
10.	TUNER MICROPROCESSOR SPECIFICATIONS	19
11.	VOLTAGE CONVERSION	22
12.	ELECTRICAL PARTS LIST	23

marantz®

model ST-40/ST-40L

First issue: 1990

4822 725 50914

MODEL ST-40/ST-40L TECHNICAL SPECIFICATIONS (DIN)

FM Stage 87.5~108 MHz

Sensitivity
DIN mono (s/n 26 dB 75 Ohms) ..... 0.9 μV
DIN stereo (s/n 46 dB 75 Ohms) ..... 25 μV
Selectivity adjacent channel 98 MHz ..... 65 dB
Tuner output (1 kHz 75 kHz Deviation) ..... 940 mV

Signal to noise ratio
S/N DIN weighted mono ..... 80 dB
S/N DIN weighted stereo ..... 73 dB
Total harmonic distortion mono 0.1%

Total harmonic distortion stereo 0.2%
Accuracy of frequency response
across 30 Hz~15 kHz bandwidth ..... +0.5/−2.0 dB

Stereo separation ..... 45 dB

MW Stage (531~1602 kHz)

Sensitivity (s/n 20 dB 30% mod. 1 MHz) ..... 400 μV
Selectivity 1 MHz 9 kHz ..... 30 dB
Signal to noise ratio at 1 MHz ..... 52 dB

LW Stage (152~282 kHz)

Sensitivity (s/n 20 dB 30% mod. 250 kHz) ..... 800 μV
Signal to noise ratio at 250 kHz ..... 50 dB

General

Power Requirements
/02 and /60, /65 versions ..... 220/240V AC, 50/60 Hz
/01 version (4 Voltages) ..... 110/120/220/240V AC, 50/60 Hz
Dimensions
Panel Width ..... 420 mm
Panel Height ..... 73 mm
Depth ..... 280 mm
Weight
Unit Alone ..... 3.3 kg

Specifications subject to change without prior notice.

MARANTZ DESIGN AND SERVICE

Using superior design and selected high grade components, MARANTZ company has created the ultimate in stereo sound.
Only **original MARANTZ parts** can insure that your MARANTZ product will continue to perform to the specifications for which it is famous.

Parts for your MARANTZ equipment are generally available to our National Marantz Subsidiary or Agent.

MARANTZ INTERNATIONAL
Vestdijk 9
5600 MD Eindhoven
The Netherlands
Phone: +31/40.758290
Telefax: +31/40.75.82.99
Telex: 35000 PHTC NL routing IND NLMTFAT

ORDERING PARTS:

Parts can be ordered either by mail or by telex. In both cases, correct part number has to be specified.
The following information must be supplied to eliminate delays in processing your order:

1. Complete address
2. Complete part numbers and quantities required
3. Description of parts
4. Model number for which part is required
5. Way of shipment
6. Signature: any order form or telex must be signed otherwise such part order will be considered as null and void.

PARTS ORDERING

Parts may be ordered at the following addresses:

AUSTRIA
HORNYPHON
Vertriebsgesellschaft GmbH
Wienerbergstrasse 1
A 1101 Wien
Austria
Telex: 132.332

BELGIUM
SVD DIVISION MARANTZ
Industrialaan 1
1720 Groot-Bijgaarden
Belgium
Telex: 24466

CHILE
MARANTZ
DIVISION OF PHILIPS S.A.
AV. Santa Maria, 0760
Casilla 2687
Santiago
Telex: 240.239

DENMARK
MARANTZ
DIVISION OF PHILIPS
SERVICE A/S
Prags Boulevard 80
Postbox 1919
DK-2300 København S
Denmark
Telex: 31201

FINLAND
MARANTZ
DIVISION OF OY PHILIPS Ab
Kaivokatu 8
00100 Helsinki
Finland
Telex: 124811

FRANCE
MARANTZ FRANCE
4 Rue Bernard Palissy
92600 Asnières
France
Telex: 611651

GERMANY
MARANTZ GERMANY GmbH
Alexanderstrasse 1
2000 Hamburg
Germany

THE NETHERLANDS
Elpro Marantz
Wint Hontlaan 28
3526 KV Utrecht
The Netherlands
Telex: 4748

NORWAY
MARANTZ
DIVISION OF PHILIPS A/S
Sandstuveien 40
0680 Oslo 6
Norway
Telex: 72640

GREAT BRITAIN
MARANTZ AUDIO U.K. Ltd
Unit 15/16
Saxon Way Industrial Estate
Moor Lane
Harmondsworth UB7 OLW
Great Britain
Telex: 935196

GREECE
SHERTON ELECTRONICS S.A.
P.O.Box 21025
Hippocratus Street 188
Athens 11471
Greece
Telex: 216.795

JAPAN
MARANTZ JAPAN, Inc.
35-1, 7-chome, Sagamiono
Sagamihara-shi, Kanagawa
Japan

KUWAIT
AL ALAMIAH ELECTRONICS
Ussama Building
Fahd al Saleem Street
P.O.Box 23781
Safat-Kuwait
Telex: 22694

ITALY
MARANTZ ITALIANA S.P.A.
Via Chiese, 74
20126 Milano
Italy

SAUDI ARABIA
AL ALAMIAH ELECTRONICS
P.O.Box 5954
University Street
Riyadh 11432
Saudi Arabia
Telex: 401530

SOUTH AFRICA
MARANTZ
DIVISION OF PHILIPS S.A.
Main Road Martindale
P.O. Box. 58088
Newville 21114
South Africa

SPAIN
PHONO S.A.
Ignacio Iglesias 10
Badalona (Barcelona)
Spain
Telex: 59355

SWEDEN
MARANTZ
DIVISION OF PHILIPS
Försäljning AB
Tegeluddsvägen 1
S-115 84 Stockholm
Sweden
Telex: 14060

SWITZERLAND
MARANTZ
Technischer Service
Duenstrasse 3
3186 Düdingen
Switzerland

TURKEY
DOGRUOL Ltd.
I.M.C.
6 Blok N°6310
Unkapani
Istanbul
Turkey
Telex: 22085

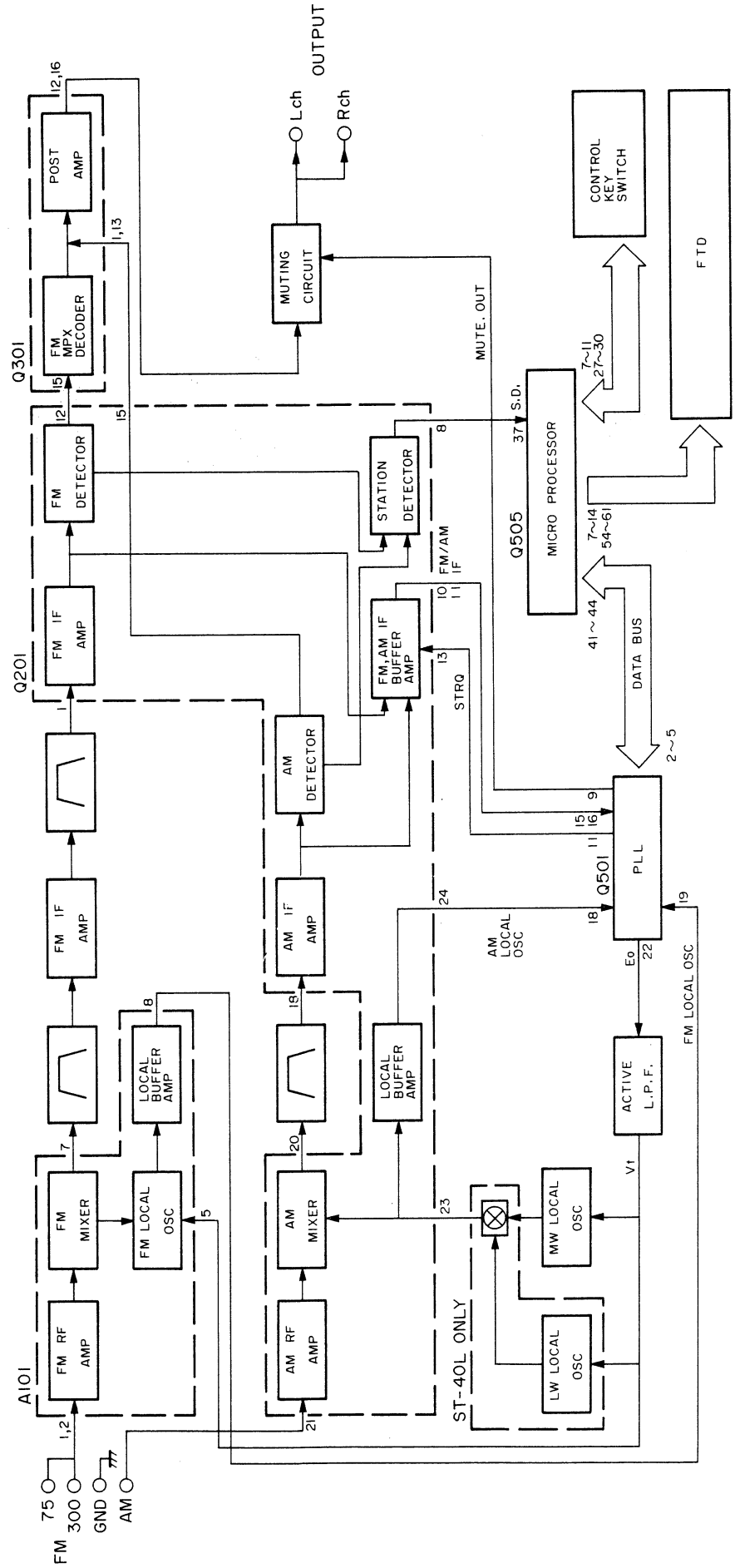
MALTA
CACHIA & GALEA
Republic Street, 68D
Valetta
Telex: 1682

PORTUGAL
MARANTZ
Divisao philips S.A. service
Outurela-carnaxide
2795 LinDA-A-VELHA
Telex: 43906

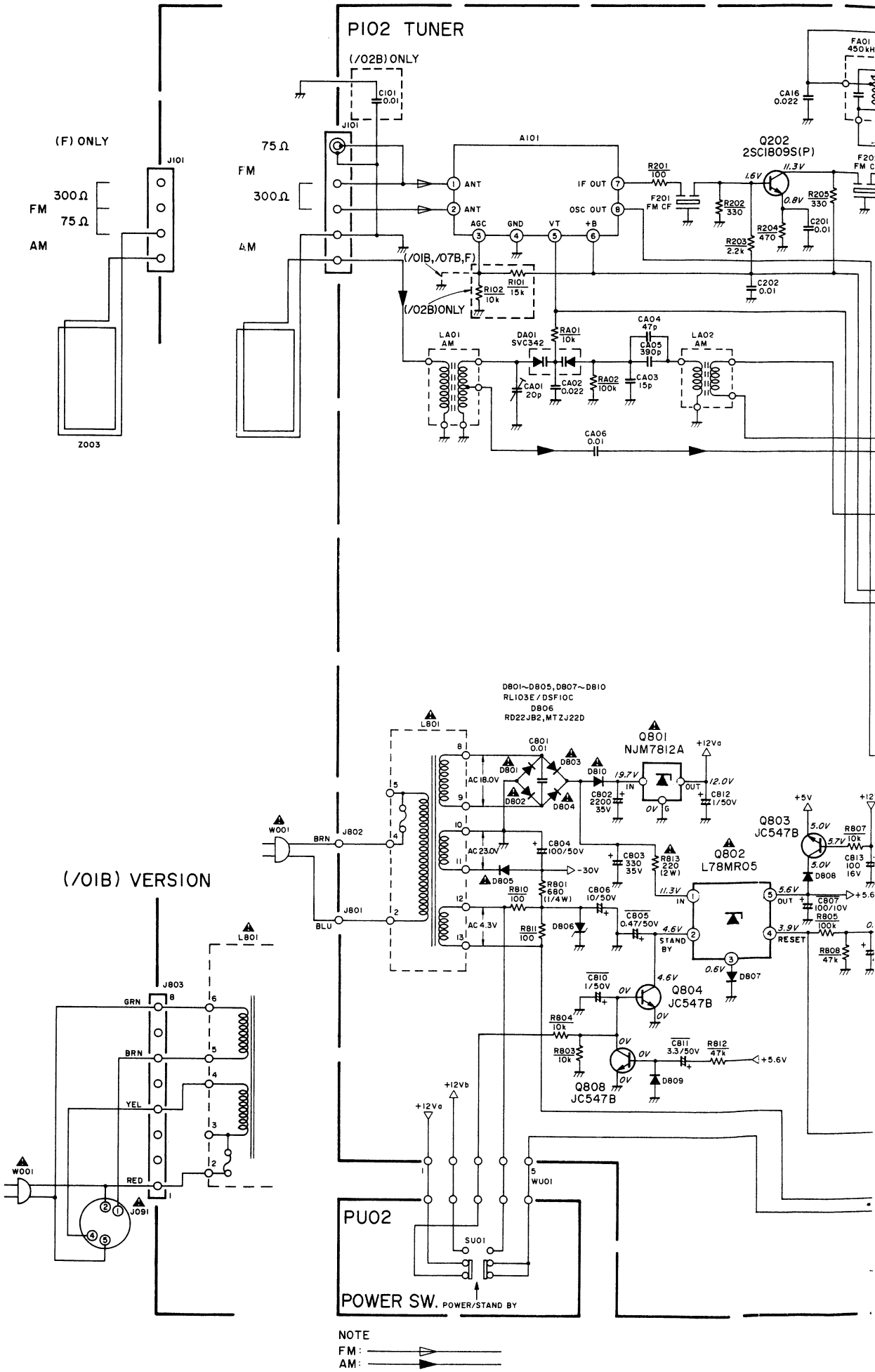
All of the above locations are fully equipped to take care of your total service needs. Because various countries have differing configuration requirements, it is necessary that you contact the service facility in your particular country. In the event that there is no service location listed for your country, please, contact the nearest facility for the necessary assistance.

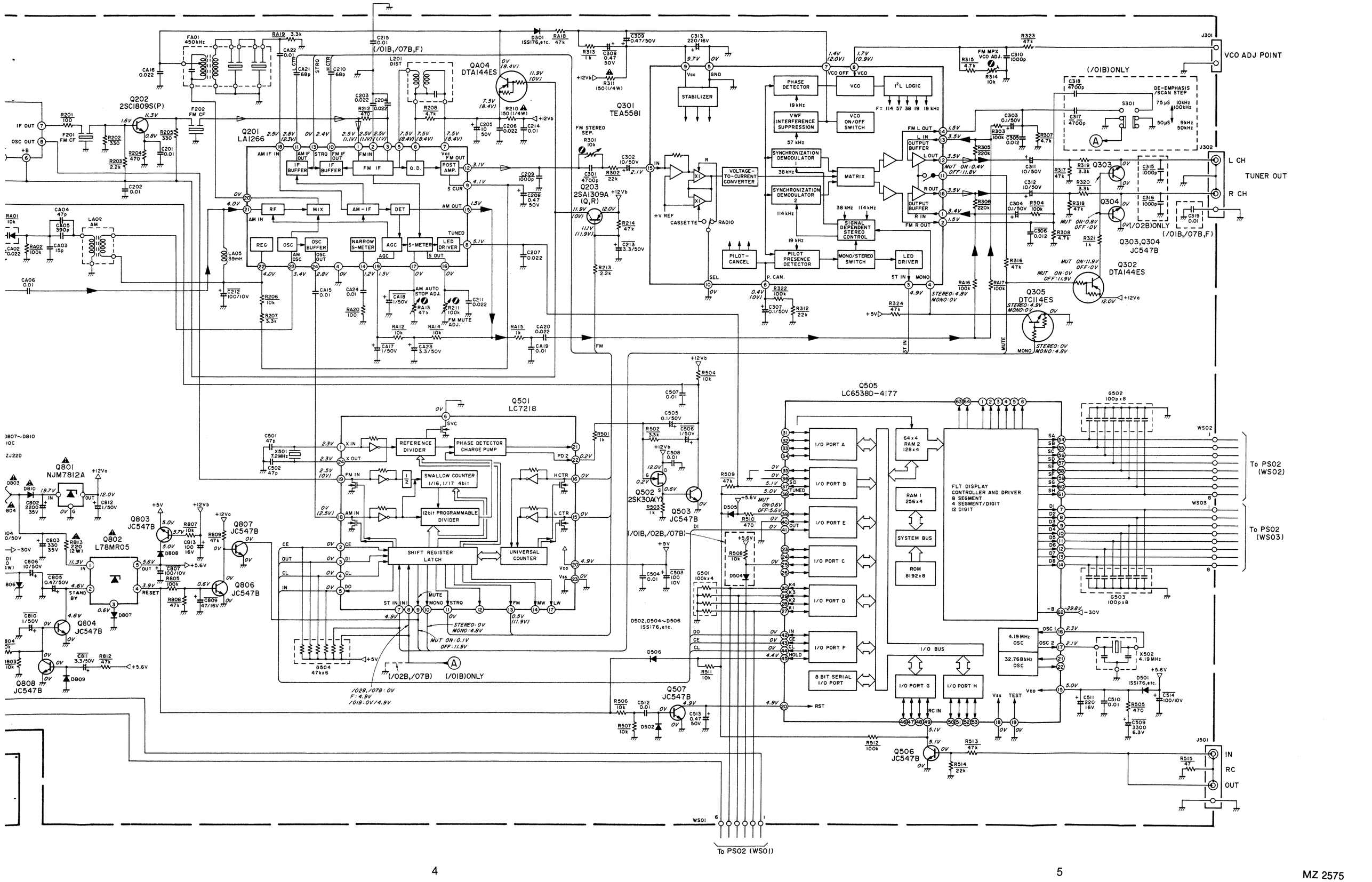
In case of difficulties, do not hesitate to contact the Technical Department at abovementioned address.

1. BLOCK DIAGRAM



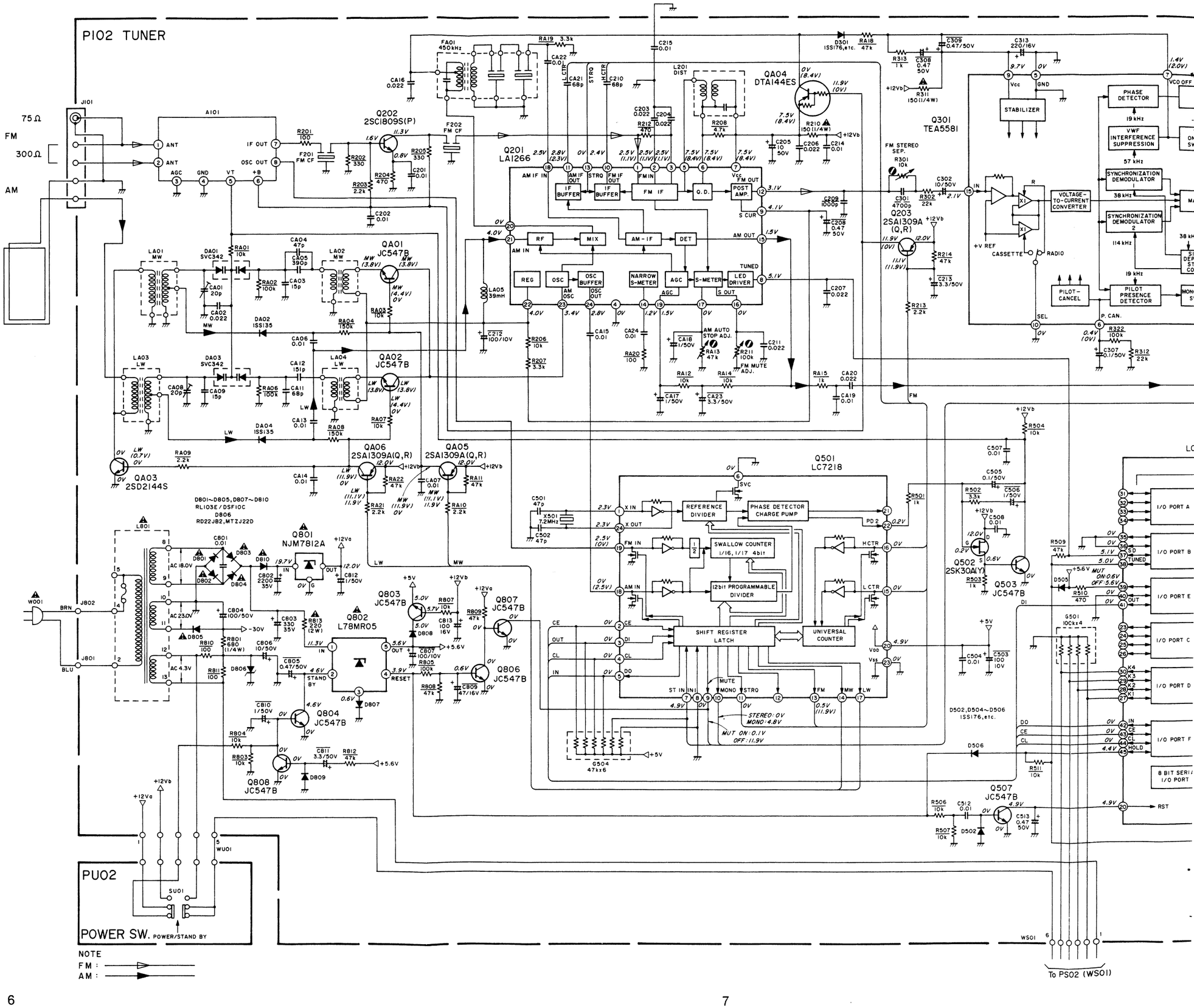
2. SCHEMATIC DIAGRAM (ST-40)

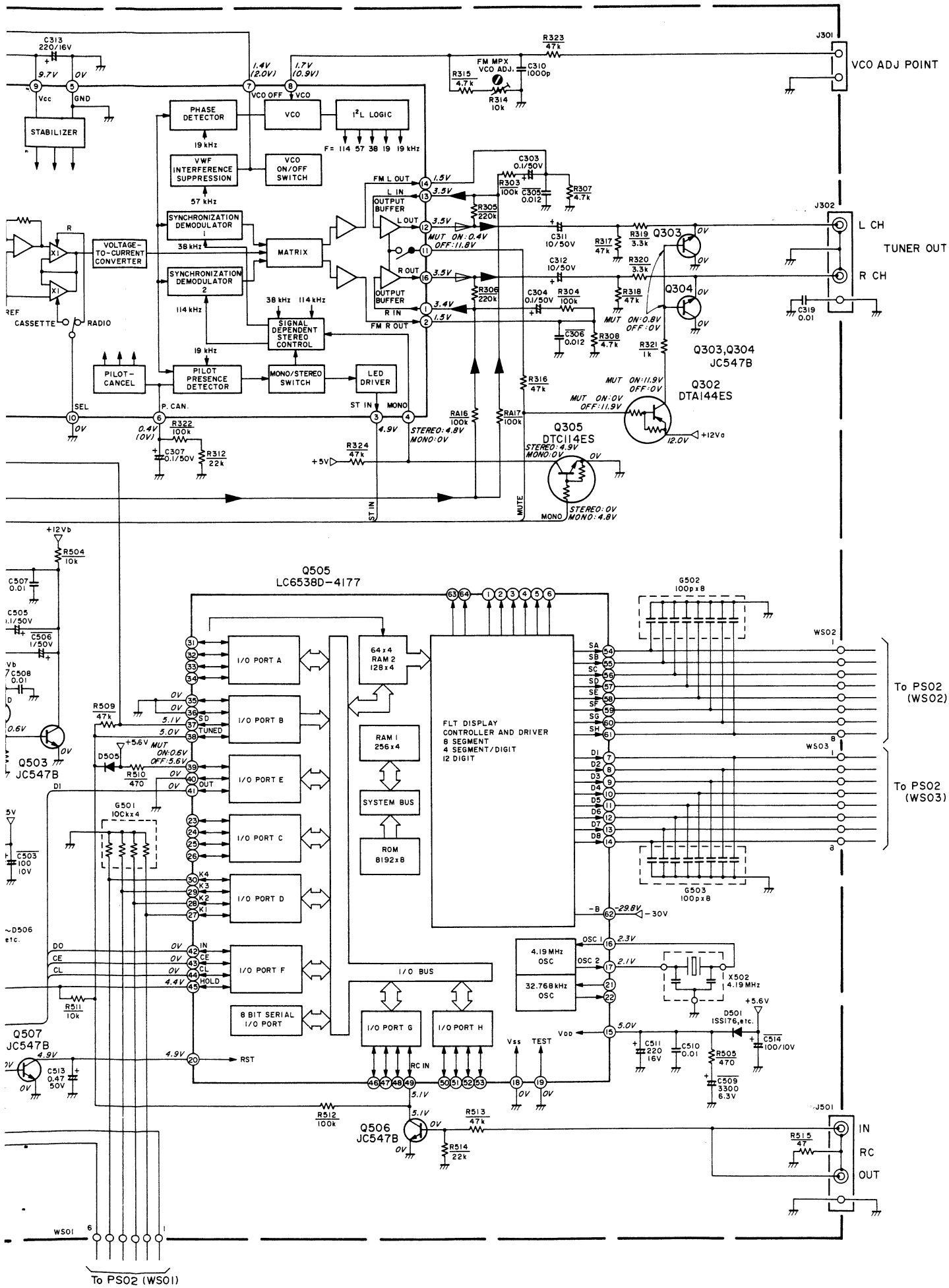



Q202 2SC1809S(P)
Q201 LA1266
Q203 2SA1309A (Q,R)
Q301 TEA5581
QA04 DTA144ES
Q501 LC7218
Q505 LC6538D-4177
Q801 NJM7812A
Q802 L78MR05
Q803 JC547B
Q804 JC547B
Q806 JC547B
Q807 JC547B
Q808 JC547B
Q502 2SK30A(Y)
Q503 JC547B
Q506 JC547B
Q507 JC547B
Q303,Q304 JC547B
Q302 DTA144ES
Q305 DTC114ES
FA01 450kHz
F201 FM CF
F202 FM CF
L201 DIST
LA01 AM
LA02 AM
LA05 39mH
X501 7.2MHz
X502 4.19MHz
IF OUT
OSC OUT
AM IF IN
AM IF OUT
STRO
FM IF OUT
FM IN
Vcc
FM OUT
IF BUFFER
IF BUFFER
FM IF
Q.D.
POST AMP
S CUR
AM OUT
RF
MIX
AM-IF
DET
AM IN
REG
OSC
OSC BUFFER
NARROW S-METER
AGC
S-METER
LED DRIVER
TUNED
S OUT
AM OSC
OSC OUT
AM AUTO STOP ADJ.
FM MUTE ADJ.
FM STEREO SEP.
IN
VOLTAGE-TO-CURRENT CONVERTER
CASSETTE
RADIO
+V REF
PHASE DETECTOR
VWF INTERFERENCE SUPPRESSION
SYNCHRONIZATION DEMODULATOR
SYNCHRONIZATION DEMODULATOR 2
PILOT-CANCEL
PILOT PRESENCE DETECTOR
STABILIZER
VCO
VCO ON/OFF SWITCH
I²L LOGIC
MATRIX
SIGNAL DEPENDENT STEREO CONTROL
MONO/STEREO SWITCH
LED DRIVER
FM MPX VCO ADJ.
VCO ADJ POINT
(/01B)ONLY
DE-EMPHASIS /SCAN STEP
75µS 10kHz 100kHz
50µS 9kHz 50kHz
OUTPUT BUFFER
L IN
L OUT
R IN
R OUT
FM L OUT
FM R OUT
L CH
R CH
TUNER OUT
(/01B,/07B,F)
(/02B)ONLY
REFERENCE DIVIDER
PHASE DETECTOR CHARGE PUMP
SWALLOW COUNTER 1/16, 1/17 4bit
12bit PROGRAMMABLE DIVIDER
SHIFT REGISTER LATCH
UNIVERSAL COUNTER
I/O PORT A
I/O PORT B
I/O PORT C
I/O PORT D
I/O PORT E
I/O PORT F
8 BIT SERIAL I/O PORT
I/O PORT G
I/O PORT H
I/O BUS
64x4 RAM 2 128x4
RAM 1 256x4
SYSTEM BUS
ROM 8192x8
FLT DISPLAY CONTROLLER AND DRIVER
8 SEGMENT
4 SEGMENT/DIGIT
12 DIGIT
4.19MHz OSC
32.768kHz OSC
To PS02 (WS01)
To PS02 (WS02)
To PS02 (WS03)
IN
RC
OUT
MUTE
STEREO: 4.9V MONO: 0V
STEREO: 0V MONO: 4.8V
MUT ON: 0.1V OFF: 11.9V
/02B,/07B: 0V F: 4.9V /01B: 0V/4.9V

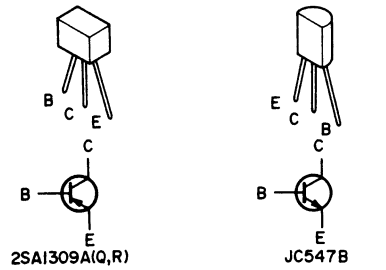
MZ 2575

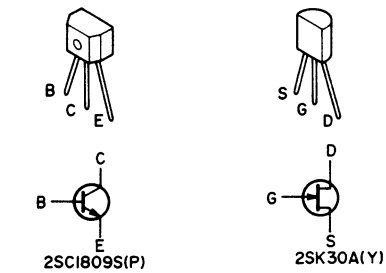
3. SCHEMATIC DIAGRAM (ST-40L)

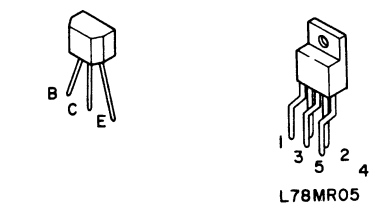


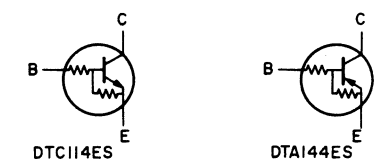

VCO ADJ POINT
J301
J302
L CH
TUNER OUT
R CH
J501
IN
RC
OUT
PHASE DETECTOR
VCO
I²L LOGIC
STABILIZER
VWF INTERFERENCE SUPPRESSION
VCO ON/OFF SWITCH
SYNCHRONIZATION DEMODULATOR 1
SYNCHRONIZATION DEMODULATOR 2
VOLTAGE-TO-CURRENT CONVERTER
MATRIX
SIGNAL DEPENDENT STEREO CONTROL
PILOT-CANCEL
PILOT PRESENCE DETECTOR
MONO/STEREO SWITCH
LED DRIVER
OUTPUT BUFFER
FM MPX VCO ADJ.
CASSETTE
RADIO
Q303,Q304 JC547B
Q302 DTA144ES
Q305 DTC114ES
Q505 LC6538D-4177
I/O PORT A
I/O PORT B
I/O PORT C
I/O PORT D
I/O PORT E
I/O PORT F
8 BIT SERIAL I/O PORT
I/O PORT G
I/O PORT H
64x4 RAM 2 128x4
RAM 1 256x4
SYSTEM BUS
ROM 8192x8
I/O BUS
FLT DISPLAY CONTROLLER AND DRIVER 8 SEGMENT 4 SEGMENT/DIGIT 12 DIGIT
4.19MHz OSC
32.768kHz OSC
X502 4.19MHz
Q503 JC547B
Q506 JC547B
Q507 JC547B
To PS02 (WS02)
To PS02 (WS03)
To PS02 (WS01)
WS01
WS02
WS03
G501 100kx4
G502 100pxB
G503 100pxB
D501 1SS176,etc.
D505
RST
RC IN
TEST
Vss
Vdd
MUTE
ST IN
FM L OUT
FM R OUT
L IN
R IN
L OUT
R OUT

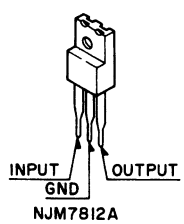
4. PARTS LOCATIONS

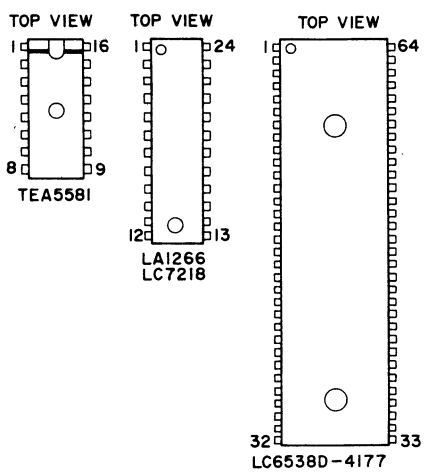


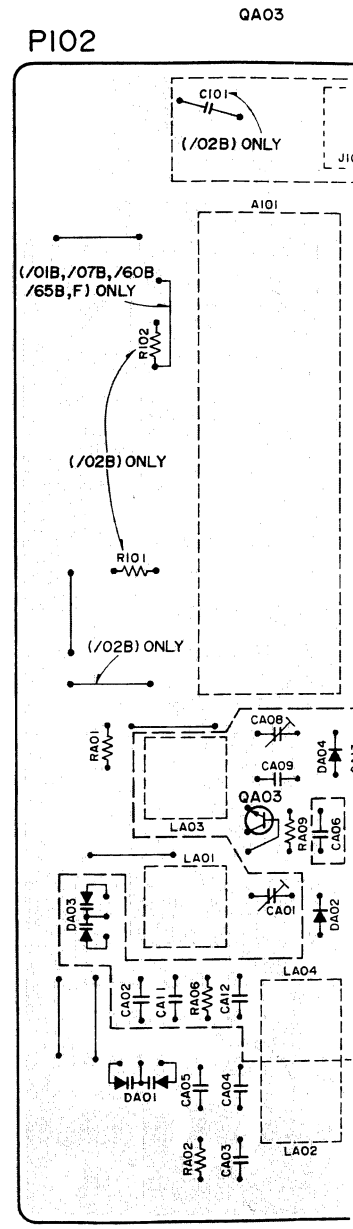




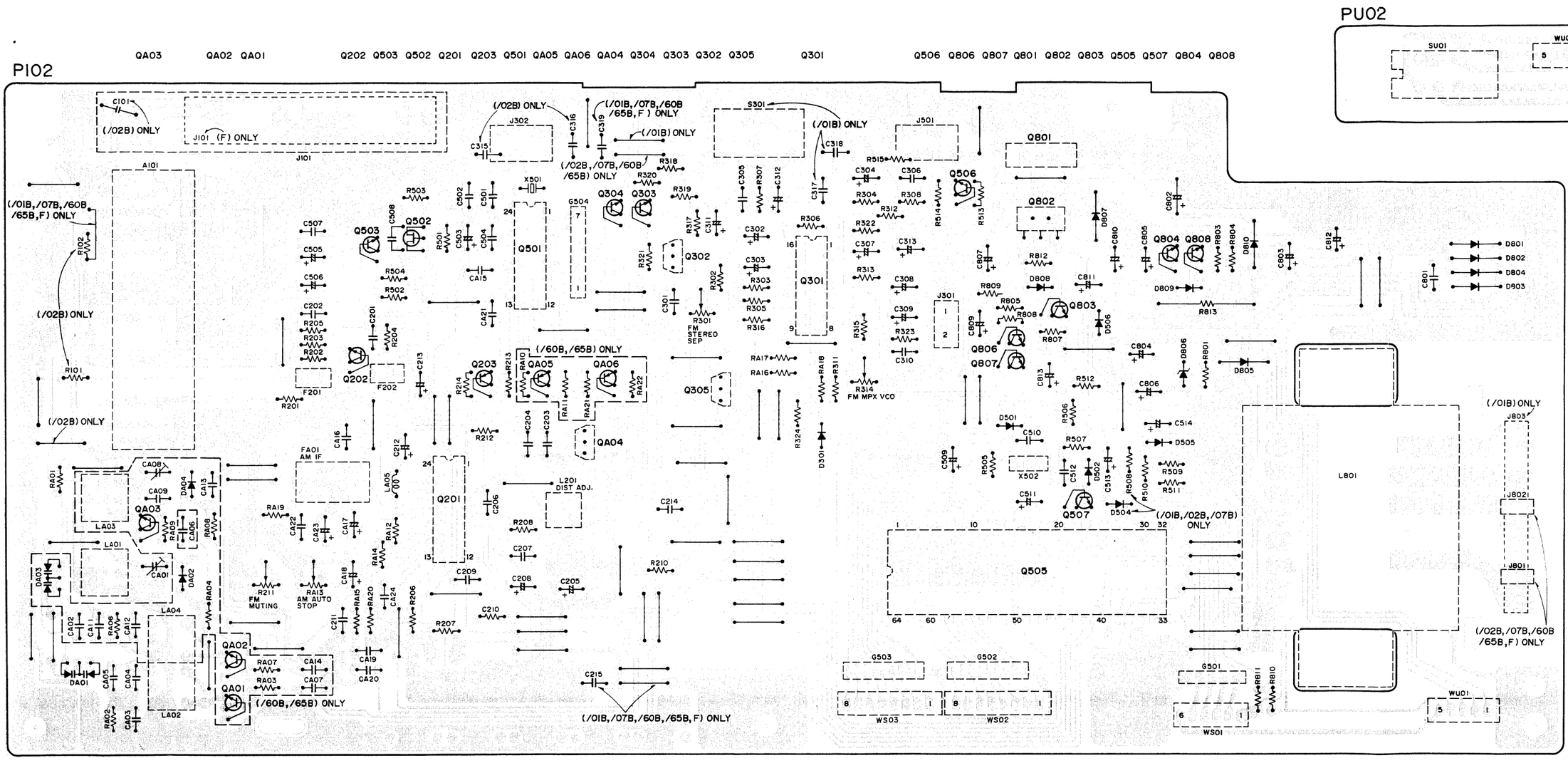


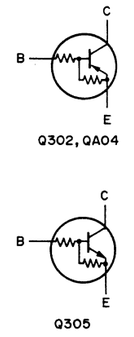




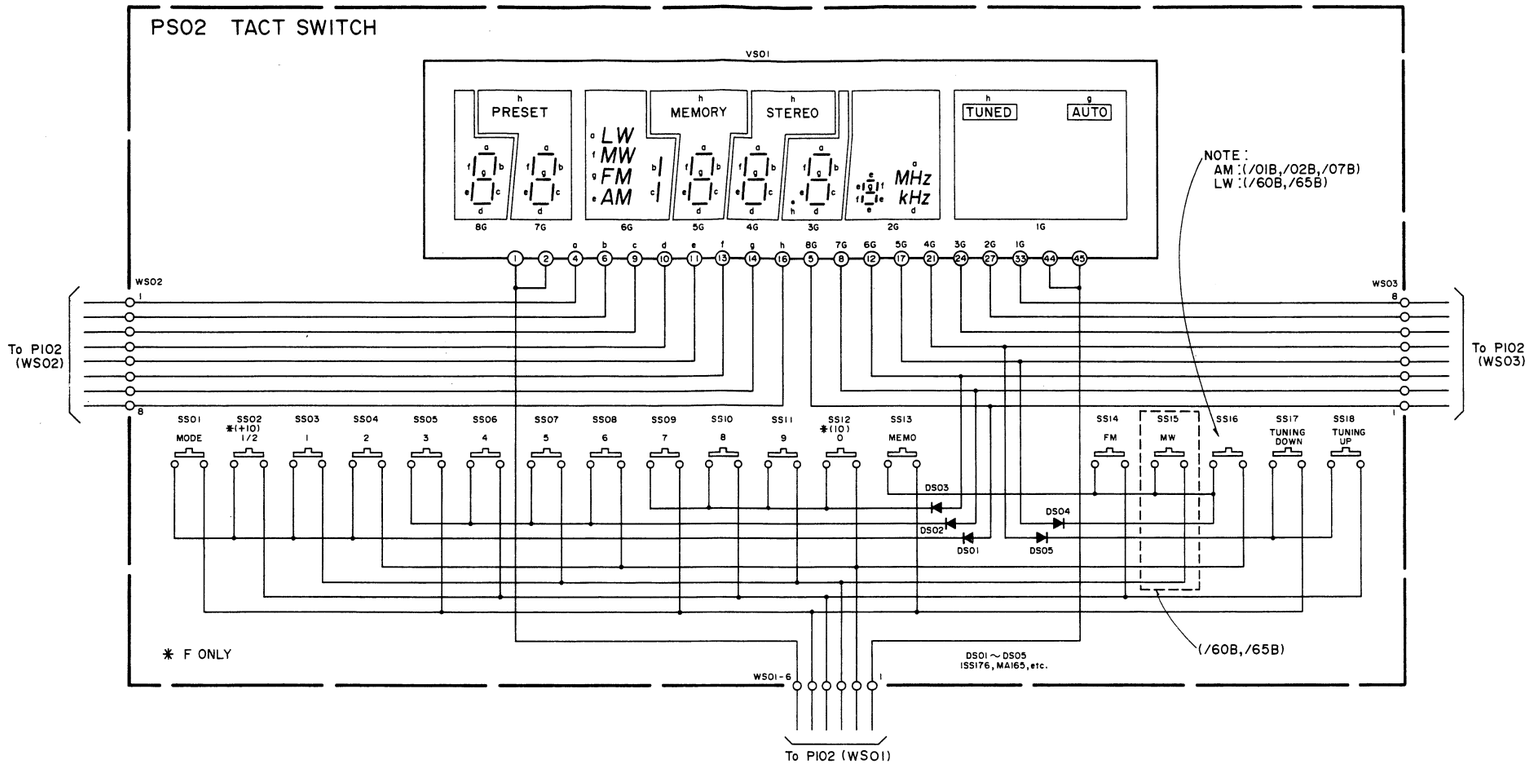


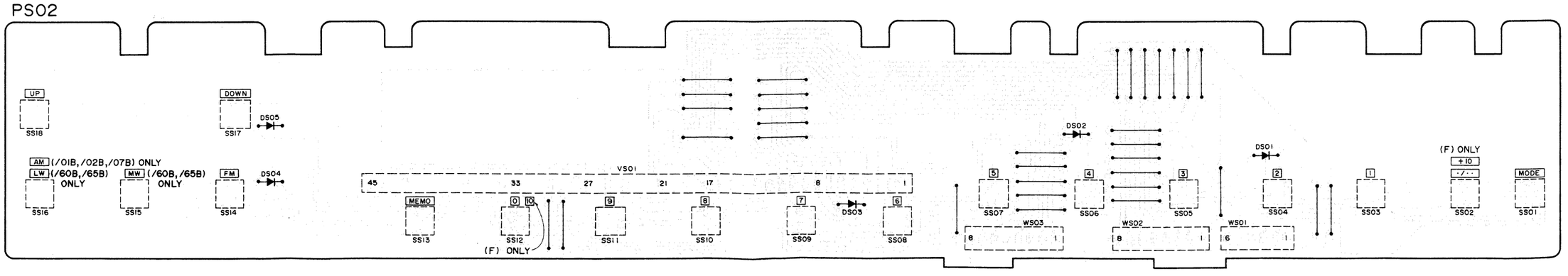
4. PARTS LOCATIONS (PATTERN SIDE)



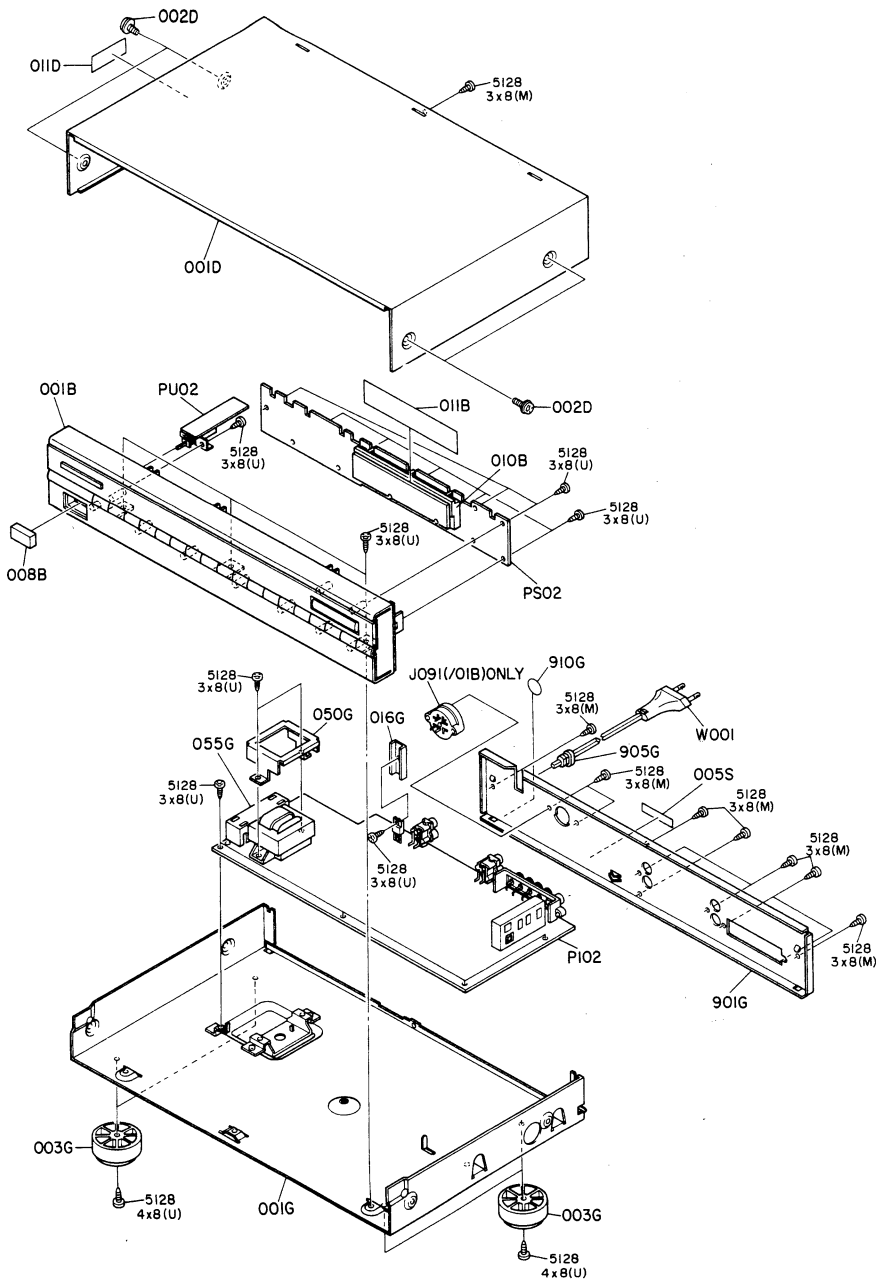


5. SCHEMATIC DIAGRAM AND PARTS LOCATIONS (PATTERN SIDE)





6. EXPLODED VIEW AND PARTS LIST



REF. DESIG.	PART NO.	DESCRIPTION
001B	4822 426 51444	Front Panel Assembly /01B/02B/07B
	4822 426 51445	Front Panel Assembly /60B/65B
008B	4822 410 60395	Button, Power
010B	4822 255 41068	Holder, FL
011B	4822 459 10942	Sticker, FL
002D	4822 501 11008	Screw
003G	4822 462 41477	Leg
055G	4822 426 60586	Cover, AC Pin
905G	4822 532 60948	Bushing, AC Cord
▲ J091	4822 272 10235	Voltage Selector /01B
001T	4822 736 20714	User Manual

7. SERVICE PROGRAM

1. T.R POINT ME (tracking point memory) mode.
   From power OFF (backup mode), when the power switch is pressed ON while pressing the FM or AM (MW) band key simultaneously, the T.R POINT ME mode is called.

		P1	P2	P3	P4	P5	P6	P7	P8	P9
FM	EUROPE USA JAPAN	90MHz 90MHz 78MHz	98MHz 98MHz 83MHz	106MHz 106MHz 88MHz						
AM	9kHz without LW 9kHz with LW 10kHz				603kHz 603kHz 600kHz	999kHz 999kHz 1000kHz	1404kHz 1404kHz 1400kHz	— 173kHz —	— 209kHz —	— 272kHz —

		P10	P11	P12 ~ P30
FM	EUROPE USA JAPAN			—
AM	9kHz without LW 9kHz with LW 10kHz	— 152kHz —	— 531kHz —	

—: Low end frequency of the FM or AM (MW) band.

2. Segment check mode
   1) In the above situation, further press the FM or AM (MW) band key simultaneously.
   2) The muting signal is output and the service program is started. During the execution of the service program, muting remains ON.
   3) The fluorescent display all goes out once, lighting is performed from segments D1-a to D8-h sequentially one after another at a rate of 0.3 second/segment. (A segment once lit does not go out as it stands.)
   4) When all the segments light, the segment check mode is terminated with their lighting for 3 seconds as they are. (The band and frequency engaged right before the segment chec mode are restored.)
      During the lighting for 3 seconds, when the MEMORY key is pressed, all the segments continue lighting as they are.
      When the MEMORY key is pressed once again, all the segments flicker for 3 seconds (at 1 Hz), with which the segment check mode is then terminated.
   5) During the execution of the segment check mode, any other key than the MEMORY key is not accepted.
   6) In the state of 3), when the MEMORY key is pressed, the state that all the segments light is entered. Namely, by the pressure of the MEMORY key, it is possible to skip over the process that all segments light one after another in sequence.

   * During the execution of the service program, when the power is turned once OFF and then ON, the service program is canceled.

8. TUNER ALIGNMENT PROCEDURES

Set to T.R point ME mode of the service program.
(P2) to (P6) in the Digital Readout Frequency Setting column shows preset numbers for the above mode.
Before alignment, connect a dummy resistor of 47 kohms to the tuner output terminal.

8-1. FM Alignment Procedures

(Function switch at "FM" position and MODE switch at "MONO" position)

- **FM RF Alignment**

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	FM signal generator to FM antenna terminal. Adjust the RF signal output so that slight noise occurs at the upper and lower sides of the output waveform.	98.0 MHz	AC VTVM to L- or R-channel output (J302)	98.0 MHz (P2)	Front end IFT for maximum output and minimum distortion.
2	FM signal generator 500 μV output to FM antenna terminal (75-ohm).	98.0 MHz	Distortion meter to L- or R-channel output (J302)	98.0 MHz (P2)	L201 core for minimum distortion.

- **FM MPX VCO Alignment**

1	FM signal generator 500 μV output to FM antenna terminal (74-ohm). (Signal is no modulation)	98.0 MHz	Frequency counter between 1 and 2 of J301 (J301)	98.0 MHz (P2)	R314 for 228 kHz on the frequency counter

- **FM IF Alignment**
  (Function switch at "FM" position and MODE switch at "AUTO STEREO" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	FM signal generator 500 μV output modulated by MPX signal generator to FM antenna terminal (75-ohm). Modulation level: IHF 67.5 kHz +9 % pilot dev. DIN 40 kHz +8 % pilot dev.	Stereo L-channel (1.000 Hz)	VTVM to L-channel output (J302 L-channel)	98.0 MHz (P2)	Front end IFT for minimum distortion.
2		Stereo R-channel (1,000 Hz)	VTVM to R-channel output (J302 R-channel)		

- **Muting Level Alignment**
  (Function switch at "FM" position and MODE switch at "AUTO STEREO" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	FM signal generator 6.3 μV output to FM antenna terminal (75-ohm)	98.0 MHz	AC VTVM to L- or R-channel output (J302)	98.0 MHz (P2)	R211 to a point at which output appears.

• Multiplex Alignment

(Function switch at "FM" position and MODE switch at "AUTO STEREO" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	FM signal generator 500 μV output modulated by MPX signal generator to FM antenna terminal (75-ohm) Modulation level: IHF 67.5 kHz +9 % pilot dev. DIN 40 kHz +8 % pilot dev.	Stereo L-channel (1,000 Hz)	VTVM to R-channel output (J302 R-channel)	98.0 MHz (P2)	R301 so that channel separation is identical between both channels.
2		Stereo R-channel (1,000 Hz)	VTVM to L-channel output (J302 L-channel)		
3	Repeat steps 1 and 2.				

8-2. AM/LW Alignment Procedures

(Function switch at "AM" position)

• AM IF Alignment

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	Sweep generator to AM antenna terminal	450 kHz	AC VTVM to L- or R-channel output (J302)	—	FA01 for maximum and symmetrical waveform.

• AM RF Alignment

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	AM signal generator to AM loop antenna in a test loop	603 kHz	VTVM to L- or R-channel output (J302)	603 kHz (P4)	LA01 for maximum output.
2		1,404 kHz		1,404 kHz (P6)	CA01 for maximum output.
3	Repeat steps 1 and 2 until sensitivity is maximized.				

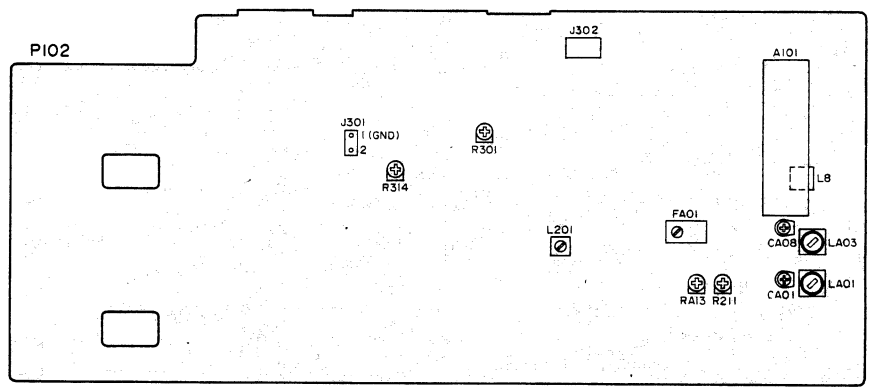
• LW RF Alignment

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	AM signal generator to AM loop antenna in a test loop	173 kHz	VTVM to L- or R-channel output (J302)	173 kHz (P7)	LA03 for maximum output.
2		272 kHz		272 kHz (P9)	CA09 for maximum output.
3	Repeat steps 1 and 2 until sensitivity is maximized.				

• AM Auto Stop Alignment (Function switch at "AM" position)

Step	Signal Source Connection	Signal Frequency	Indicator Connection	Digital Readout Frequency Setting	Adjust
1	RF generator to AM loop antenna in a test loop (500 μV/m)	999 kHz	—	999 kHz (P5)	RA13 so that the "TUNED" on the display tube lights.

9. ALIGNMENT POINTS AND TEST POINTS



10. TUNER MICROPROCESSOR SPECIFICATIONS

10-1. Receiving Frequency Range, Channel Space, Reference

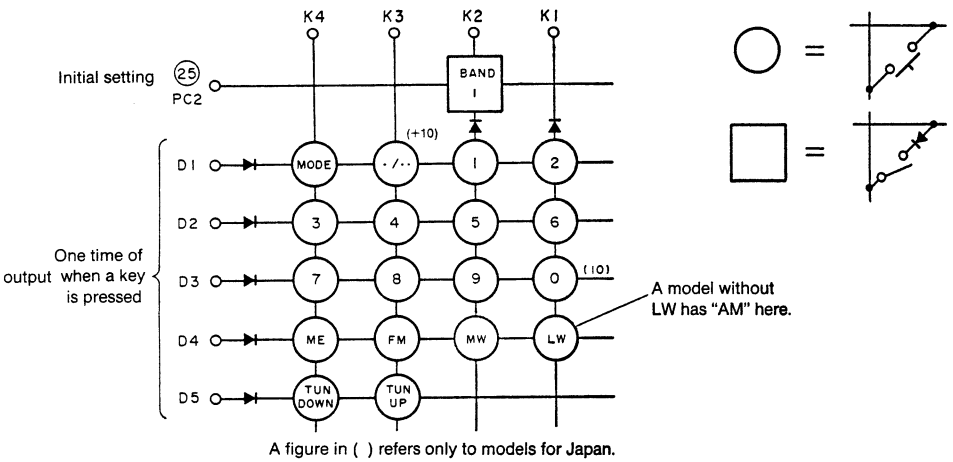
Frequency and Intermediate Frequency

		Receiving Frequency	Channel Space	Reference Frequency	Intermediate Frequency
Japan	FM	76.0~90.0 MHz	100 kHz	25 kHz	−10.7 MHz
	AM	531~1602 kHz	9 kHz	9kHz	+450 kHz
U.S.A.	FM	87.5~108.0 MHz	100 kHz	25 kHz	+10.7 MHz
	AM	520~1710 kHz	10 kHz	10 kHz	+450 kHz
Europe	FM	87.50~108.00 MHz	50 kHz	25 kHz	+10.7 MHz
	MW	531~1602 kHz	9 kHz	9 kHz	+450 kHz
	LW	152~282 kHz	1 kHz	1 kHz	+450 kHz

10-2. Tuning Function

1) Automatic Up/Down Tuning (sawtooth wave mode)
2) Manual Up/Down Tuning
   The tuning frequency varies steppedly when the momentary switch is pressed or rapidly at a rate of approximately 70 msec/step when the same switch is pressed continuously for more than 0.5 sec. In this situation, if the said switch is released from hand pressure, automatic tuning is performed.
3) Preset Memory Call
   Random access to 30 FM and AM (MW+LW) stations. Call by a numeral key + the single/double (./..) digit key + a numeral key where necessary.

Key Matrix



A figure in ( ) refers only to models for Japan.

10-3. Description of Keys

(0)~(9): Numeral keys

Preset memory writing, call and direct access call

(FM) (MW) (LW): Band selection keys

With a model without LW, "LW" key becomes "AM" key.

(MODE): Mono/stereo output selection key

At FM, when this key is pressed, OUT1 of PLL IC LC7218 varies between "LOW" and "HIGH" cyclically. In synchronization with this variation, "AUTO" in the FL display flickers.

(TUN UP) (TUN DOWN): Tuning up/down keys

The tuning frequency increases or decreases by 1 step at each pressure (for less than 0.5 second), and varies rapidly at a rate of approximately 70 msec/step when either is pressed continuously for 0.5 second or more. In this situation, when that key is released from hand pressure, auto tuning is performed.

(ME): Memory writing key

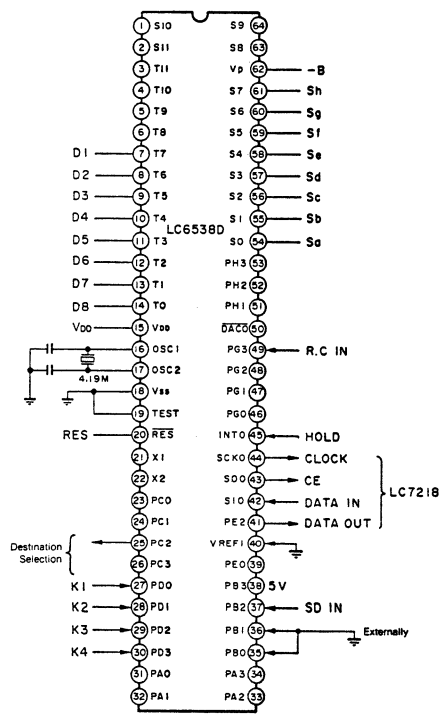
When the key is pressed, "MEMORY" flickers (at 1 Hz) for approximately 5 seconds, thus indicating that the memory is capable of writing. The wanted number is input by means of a numeral key, the 1/2 (./..) digit key and a numeral key where necessary, in which way at the point of time when a digit of units order is input, the frequency then being received is memorized.

(·/··): 1/2 digit key

This key is used in calling one of preset station numbers P10 to P30. When the key is pressed, " PRESET " is displayed, the LED segment g of units order digits lights and that of tens order digit flickers.

Flickers (for 5 seconds at 1 Hz)

Pin Connections



Pin Functions

PU: Output with pull-up MOS
OD: Open-drain output

Symbol	No. of pin(s)	I/O	Function	Output driver	Option	When resetting
V_{DD}	1	—	Power supply pin	—	—	—
Vss	1	—				
TEST	1	I	LSI test pin, which should necessarily be connected Vss for use.	—	—	—
$\overline{RES}$	1	I	System reset input. Initial reset at $\overline{RES}$="LOW"	—	—	—
OSC1	1	I	Pins to constitute the main system clock oscillation circuit.	—	—	—
OSC2	1	O	External clock is input to OSC1 with OSC2 opened. With built-in feedback resistor.			
X1	1	I	Pins to constitute the sub clock oscillation circuit.	—	—	—
X2	1	O	External clock is input to X1 with X2 opened. With built-in feedback resistor and damping resistor			
T0~T11	12	O	FL display tube digit exclusive output. Display RAM fixed address output for static mode.	P-ch high withstand voltage and large current type	Pull-down resistor existence/non-existence (bit-wise)	L
S8 ~S11	4	O	FL display tube digit/segment output. Display RAM fixed address output for static mode.	P-ch high withstand voltage and large current type	Pull-down resistor existence/non-existence (bit-wise)	L
S0~S7	8	O	FL display tube segment exclusive output. Display RAM fixed address output for static mode.	P-ch high withstand voltage and large current type	Pull-down resistor existence/non-existence (bit-wise)	L
V_P	1	—	FL display tube output pull-down resistor load power input.	—	—	—
PA_0~PA_3	4	I/O	I/O in units of bit or unit of 4 bits Input of key scan low-threshold type with a function to automatically read the key scan data into RAM.	+15 V withstand voltage and medium current type	PU or OD for each bit	H
PB_0~PB_3	4	I	Built-in comparator of 4 independent channels. Reference voltage selectable between external and internal. Input in units of bit or unit of 4 bits. At low-speed mode (1/32 mode, sub clock mode), input function is stopped.	—	—	Input function stopped
PC_0~PC_3	4	I/O	I/O in units of bit or unit of 4 bits	+15 V withstand voltage and large current type	• PU or OD for each bit • Output when resetting	L (option)
PD_0~PD_3	4	I/O	I/O in units of bit or unit of 4 bits	+15 V withstand voltage and large current type	• PU or OD for each bit • Output when resetting	L (option)
PE_0~PE_2	4	I/O	I/O in units of bit or unit of 3 bits PE_0/V_{REF0} Used with external reference input of PB1-PB3 PE_1/V_{REF1} Used with external reference input of PB0 PE_2/START Used with HALT control START	+15 V withstand voltage and medium current type only of PE2. Normal withstand voltage and medium current type of others.	PU or OD for each bit	H
PF_0~PF_3	4	I/O	I/O in units of bit or unit of 4 bits PF_0/SI0 Used with serial input S10 PF_1/SO0 Used with serial output SO0 PF_2/SCK0 Used with serial clock I/O SCK0 PF_3/INT0 Used with INT0 interrupt input	+15 V withstand voltage and medium current type	PU or OD for each bit	H
PG_0~PG_3	4	I/O	I/O in units of bit or unit of 4 bits PG_0/SI_1 Used with serial input SI1 $PG_1/\overline{SO1}$ Used with serial output $\overline{SO1}$ $PG_2/\overline{SCK1}$ Used with serial clock I/O $\overline{SCK1}$ $PG_3/\overline{INT1}$ Used with $\overline{INT1}$ interrupt input	+15 V withstand voltage and medium current type	PU or OD for each bit	H
PH_0~PH_3	4	I/O	I/O in units of bit or unit of 4 bits $PH_0/\overline{DAC0}$ Used with 6-bit PWM D/A output $PH_1/\overline{DAC1}$ Used with 8/14-bit PWM D/A output PH_2/SQR Used with square wave pulse output PH_3/HCNT Used with horizontal sync detection input	+15 V withstand voltage and medium current type	PU or OD for each bit	H

10-4. Pin Description

Sa~Sh : Fluorescent display segment signals

D_1~D_8 : Fluorescent display digit signals and key return signals

K_1 ~K_4 : Key input, diode matrix input

CLOCK, CE, DATA IN, DATA OUT: Signals transferred to PLL IC LC7218

SD IN: Station detector signal input
When the SD IN pin becomes "LOW" as regards a frequency band, the STRQ pin (LC7218 OUT2) becomes "HIGH" so that PLL IC performs IF counting. As a result of this, when FM 10.7 MHz ±10 kHz, MW 450 kHz ±3 kHz or LW 450 kHz ±0.6 kHz is obtained, "TUNED" lights, while when in the auto tuning mode, the station scanning stops.

BAND 1: **Destination selection initial setting diode**
[combined with port 8 of PLL IC LC7218 (Q501)]

	USA	JAPAN	EUROPE without LW	EUROPE with LW
BAND 1	1	0	1	0
IN 1 (PLL IC)	1	1	0	0

BAND 1
1: With diode (D504)
0: Without diode

IN 1
1: "HIGH", 0: "LOW"

LC7218 Port Assignment:

OUT0: $\overline{MUT}$, Audio mute output (active "LOW")
OUT1: FM MONO output
OUT2: STRQ output
OUT4: $\overline{FM}$, FM band selection
OUT5: $\overline{AM}$, AM (MW) band selection
OUT6: $\overline{LW}$, LW band selection

	OUT 0 PIN ⑨	OUT 1 PIN ⑩	OUT 2 PIN ⑪	OUT 4 PIN ⑬	OUT 5 PIN ⑭	OUT 6 PIN ⑰
	MUT OUT	FM MONO	STRQ	$\overline{FM}$	$\overline{AM}$	$\overline{LW}$
FM	1/0	1/0	1/0	0	1	1
AM (MW)		1		1	0	1
LW				1	1	0

IN 0: STEREO IN (PIN ⑦)
IN 1: Destination selection (PIN ⑧)

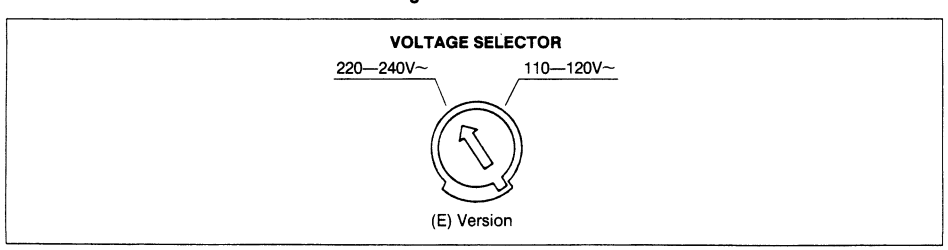
11. VOLTAGE CONVERSION

- **EUROPEAN MODEL ONLY**

To convert the unit to a different power source voltage, change the position as illustrated in the drawing below.

CAUTION
DISCONNECT POWER SUPPLY CORD FROM AC OUTLET BEFORE CONCVERTING VOLTAGE.

Voltage Conversion Chart



(E) Version

12. ELECTRICAL PARTS LIST

ASSIGNMENT OF COMMON PARTS CODES.

RESISTOR
R***: (1) GD05 ··· 140, Carbon film fixed resistor, ±5%, 1/4W
R***: (2) GD05 ··· 160, Carbon film fixed resistor, ±5%, 1/6W
① — Resistance value

Examples
① Resistance value
0.1Ω...001 10Ω...100 1kΩ...102 100kΩ...104
0.5Ω...005 18Ω...180 2.7kΩ...272 680kΩ...684
1Ω...010 100Ω...101 10kΩ...103 1MkΩ...105
6.8Ω...068 390Ω...391 22kΩ...223 4.7MkΩ...475

(Note) Please distinguish 1/4W from 1/6W by the shape of parts used actually.

C***: CERAMIC CAP.
(1) DD1 ··· 370, Ceramic condenser, Disc type, Temp. coeff. P350 ~ N1000, 50V
①② — ① Capacity value, ② Tolerance

Examples
① Tolerance (Capacity deviation)
±0.25pF...0
±0.5pF...1
±5%...5
* Tolerance of COMMON PARTS handled here are as follows:
0.5pF ~ 5pF...±0.25pF
6pF ~ 10pF...±0.5pF
12pF ~ 560pF...±5%
② Capacity value
0.5pF...005 3pF...030 100pF...101
1pF...010 10pF...100 220pF...221
1.5pF...015 47pF...470 560pF...561

C***: CERAMIC CAP.
(1) DK16 ··· 300, High dielectric constant ceramic condenser, Disc type, Temp. chara. 2B4, 50V
① — Capacity value

Example
② Capacity value
100pF...101 1000pF...102 10000pF...103
470pF...471 2200pF...222

C***: ELECTROLY CAP. (⧺), FILM CAP. (≒)
(1) EA ····· 10, Electrolytic condenser, One-way lead type, Tolerance ±20%
①② — ① Dielectric strength, ② Capacity value

Examples
① Capacity value
0.1μF...104 4.7μF...475 100μF...107
0.33μF...334 10μF...106 330μF...337
1μF...105 22μF...226 1100μF...108
2200μF...228
② Working voltage
6.3V...006 25V...025
10V...010 35V...035
16V...016 50V...050

(2) DF15 ··· 350, Plastic film condenser, One-way type, Mylar ±5% 50V
① — Capacity value

Examples
① Capacity value
0.001μF (1000pF)...102 0.1μF...104
0.0018μF...182 0.56μF...564
0.01μF...103 1μF...105
0.015μF...153

REF. DESIG.	PART NO.	DESCRIPTION
		PS02-TACT SWITCH CIRCUIT BOARD
DS01 ~ DS05	4822 130 33305	Diode 1SS176, etc.
SS01 ~ SS14	4822 276 12455	Push Switch, Tact
SS15	4822 276 12455	Push Switch, Tact /60B/65B
SS16	4822 276 12455	Push Switch, Tact
SS17	4822 276 12455	Push Switch, Tact
SS18	4822 276 12455	Push Switch, Tact
VS01	4822 130 90751	Display Unit, FIP8CAM8
		PU02-POWER SWITCH CIRCUIT BOARD
SU01	4822 276 11682	Push Switch, Power/Standby
		P102-TUNER CIRCUIT BOARD
		P102-CAPACITORS
CA01	4822 125 50384	Trimming 20pF
CA02	4822 122 40491	Ceramic 0.022μF +80% −20%
CA03	4822 126 10512	Ceramic 15pF ±5%
CA04	4822 126 10513	Ceramic 47pF ±5%
CA05	4822 121 41629	Film 390pF ±5%
CA06	4822 122 32486	Ceramic 0.01μF +80% −20%
CA07	4822 122 32486	Ceramic 0.01μF +80% −20% /60B/65B
CA08	4822 125 50384	Trimming 20pF /60B/65B
CA09	4822 126 10512	Ceramic 15pF ±5% /60B/65B
CA11	4822 126 10363	Ceramic 68pF ±5% /60B/65B
CA12	4822 122 10367	Ceramic 150pF ±5% /60B/65B
CA13	4822 122 32486	Ceramic 0.01μF +80% −20% /60B/65B
CA14	4822 122 32486	Ceramic 0.01μF +80% −20% /60B/65B
CA15	4822 122 32486	Ceramic 0.01μF +80% −20%
CA16	4822 122 40491	Ceramic 0.022μF +80% −20%
CA19	4822 122 32486	Ceramic 0.01μF +80% −20%
CA20	4822 122 40491	Ceramic 0.022μF +80% −20%
CA21	4822 126 10363	Ceramic 68pF ±5%
CA22	4822 122 32486	Ceramic 0.01μF +80% −20%
CA24	4822 122 32486	Ceramic 0.01μF +80% −20%
C201	4822 122 32486	Ceramic 0.01μF +80% −20%
C202	4822 122 32486	Ceramic 0.01μF +80% −20%
C203	4822 122 40491	Ceramic 0.022μF +80% −20%
C204	4822 122 40491	Ceramic 0.022μF +80% −20%
C205	4822 124 22571	Elect 10μF 50V
C206	4822 122 40491	Ceramic 0.022μF +80% −20%
C207	4822 122 40491	Ceramic 0.022μF +80% −20%
C210	4822 126 10363	Ceramic 68pF ±5%
C211	4822 122 40491	Ceramic 0.022μF +80% −20%
C214	4822 122 32486	Ceramic 0.01μF +80% −20%
C215	4822 122 32486	Ceramic 0.01μF +80% −20% /01B/07B/60B/65B

REF. DESIG.	PART NO.	DESCRIPTION
C302	4822 124 22571	Elect 10μF 50V
C303	4822 124 90351	Elect 0.1μF 50V
C304	4822 124 90351	Elect 0.1μF 50V
C307	4822 124 90351	Elect 0.1μF 50V
C310	4822 121 41623	Film 1000pF ±5%
C311	4822 124 22571	Elect 10μF 50V
C312	4822 124 22571	Elect 10μF 50V
C313	4822 124 90364	Elect 220μF 16V
C319	4822 122 32486	Ceramic 0.01μF +80% −20% /01B/07B/60B/65B
C501	4822 126 10513	Ceramic 47pF ±5%
C502	4822 126 10513	Ceramic 47pF ±5%
C504	4822 122 32486	Ceramic 0.01μF +80% −20%
C505	4822 124 90351	Elect 0.1μF 50V
C507	4822 122 32486	Ceramic 0.01μF +80% −20%
C508	4822 122 32486	Ceramic 0.01μF +80% −20%
C510	4822 122 32486	Ceramic 0.01μF +80% −20%
C511	4822 124 90364	Elect 220μF 16V
C512	4822 122 32486	Ceramic 0.01μF +80% −20%
C513	4822 124 90351	Elect 0.1μF 50V
C801	4822 122 32486	Ceramic 0.01μF +80% −20%
C802	4822 124 22695	Elect 2200μF 35V
C806	4822 124 22571	Elect 10μF 50V
G502	4822 126 10452	Array 100pF×8
G503	4822 126 10452	Array 100pF×8
		P102-RESISTORS
RA13	4822 100 11372	47KΩ, Trimming
▲ R210	4822 050 21501	150Ω ±5% ¼W
R211	4822 100 11471	100KΩ, Trimming
R301	4822 100 11351	10KΩ, Trimming
▲ R311	4822 050 21501	150Ω ±5% ¼W
R314	4822 100 11351	10KΩ, Trimming
R801	4822 116 52924	680Ω ±5% ¼W
▲ R813	4822 116 60492	220Ω ±5% 2W
G501	4822 111 91837	100KΩ×4 ±5% 1/8W, Array
G504	4822 111 91204	47KΩ×6 ±5% 1/8W, Array
		P102-SEMICONDUCTORS
DA01	4822 125 50416	Varicap SVC342
DA02	4822 130 33697	Diode 1SS135 /60B/65B
DA03	4822 125 50416	Varicap SVC342 /60B/65B
DA04	4822 130 33697	Diode 1SS135 /60B/65B
D301	4822 130 33305	Diode 1SS176, etc.
D501	4822 130 33305	Diode 1SS176, etc.
D502	4822 130 33305	Diode 1SS176, etc.
D504	4822 130 33305	Diode 1SS176, etc. /01B/02B/07B
D505	4822 130 33305	Diode 1SS176, etc.
D506	4822 130 33305	Diode 1SS176, etc.
▲ D801 ~ ▲ D805	4822 130 32508	Diode RL103E/DSF10C
D806	4822 130 80598	Zener RD22JB2/MTZJ22D
D807	4822 130 32508	Diode RL103E/DSF10C
D808	4822 130 33305	Diode 1SS176, etc.
D809	4822 130 33305	Diode 1SS176, etc.
▲ D810	4822 130 32508	Diode RL103E/DSF10C

REF. DESIG.	PART NO.	DESCRIPTION
QA01	4822 130 62295	Transistor JC547B /60B/65B
QA02	4822 130 62295	Transistor JC547B /60B/65B
QA03	4822 130 61892	Transistor 2SD2144S(U, V) /60B/65B
QA04	4822 130 42682	Transistor Array DTA144ES
QA05	4822 130 60495	Transistor 2SA1309A(Q, R) /60B/65B
QA06	4822 130 60495	Transistor 2SA1309A(Q, R) /60B/65B
Q201	4822 209 71785	IC LA1266
Q202	4822 130 62294	Transistor 2SC1809S(P)
Q203	4822 130 60495	Transistor 2SA1309A(Q, R)
Q301	4822 209 71776	IC TEA5581
Q302	4822 130 42682	Transistor Array DTA144ES
Q303	4822 130 62295	Transistor JC547B
Q304	4822 130 62295	Transistor JC547B
Q305	4822 130 60588	Transistor Array DTC114ES
Q501	4822 209 73435	IC LC7218
Q502	4822 130 42121	F.E.T. 2SK30A(Y)
Q503	4822 130 62295	Transistor JC547B
Q505	4822 209 61794	Microprocessor LC6538D-4177
Q506	4822 130 62295	Transistor JC547B
Q507	4822 130 62295	Transistor JC547B
▲ Q801	4822 209 60826	IC NJM7812A
▲ Q802	4822 209 70385	IC L78MR05
Q803	4822 130 62295	Transistor JC547B
Q804	4822 130 62295	Transistor JC547B
Q806	4822 130 62295	Transistor JC547B
Q807	4822 130 62295	Transistor JC547B
Q808	4822 130 62295	Transistor JC547B
		P102-MISCELLANEOUS
A101	4822 210 10372	V.H.F. Tuner FE415-G09 /02B
	4822 210 10397	V.H.F. Tuner FE337-A05 /01B/07B/06B/65B
FA01	4822 242 71509	Ceramic Filter SFL450J3
F201	4822 242 71135	Ceramic Filter SFE10.7MS3-A
F202	4822 242 71135	Ceramic Filter SFE10.7MS3-A
J101	4822 267 10133	Terminal, Antenna
J302	4822 267 30498	Terminal, Tuner Output /02B
	4822 267 30741	Terminal, Tuner Output /01B/07B/60B/65B
J501	4822 266 30274	Terminal, Remote
LA01	4822 157 52328	Ant. Coil, MW
LA02	4822 157 52716	OSC Coil, MW
LA03	4822 157 52714	Ant. Coil, LW /60B/65B
LA04	4822 157 52717	OSC Coil, LW /60B/65B
LA05	4822 157 53589	Choke Coil, 39mH
L201	4822 157 60205	I.F.T. Coil, FM DET /01B/02B/07B
	4822 148 81096	I.F.T. Coil, FM DET /60B/65B
▲ L801	4822 146 30803	Power Transformer /02B/07B/60W/65W
	4822 146 21553	Power Transformer /01B
S301	4822 277 20968	Slide Switch, Scan/Step /01B
X501	4822 242 72333	Crystal 7.2MHz
X502	4822 242 72194	Ceramic Viblator, 4.19MHz

NOTE ON SAFETY:
Symbol ▲ Fire or electrical shock hazard. Only original parts should be used to replace any part marked with symbol ▲ . Any other component substitution (other than original type), may increase risk of fire or electrical shock hazard.